

### 3.0003 *Diplocentrus spitzeri*, A New Arizona Species of Scorpion<sup>1</sup>

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#### *Diplocentrus spitzeri*, NEW SPECIES

This new species is a medium sized diplocentrid scorpion. Venom characteristics are those of the family as previously reported (Stahnke, 1967). The fresh venom, upon exposure to air, develops a reddish tinge that migrates rapidly through acrylamide gel electrophoresis column without contributing to pherogram. The lyophilized venom is a blackish brown, flocculent solid while that of other families is whitish.

*Holotype*.—♂, length 46 mm, ASU #65-223, ASU repository. Locality: 8.8 mi. E. Nogales, Arizona. Microhabitat: Under stones. Collectors: Carl Spitzer family. Date: July 17, 1965.

*Allotype*.—♀, length 50 mm, ASU #66-026, ASU repository. Locality, microhabitat and collector same as for holotype. Date: February 22, 1966.

*Paratypes*.—Thirty-three ♂s, lengths 12 to 46 mm. All but two collected from same locality by Carl Spitzer family on the following dates: (3) March 27, 1965; (25) July 17, 1965; (10) February 22, 1966; (2) November 6, 1967. One collected by Bob Wesson, October 2, 1938 in the Atascos Mts. Another by Robert Flock, near the Mexican border in the same mountains on November 3, 1938. Forty ♀s, lengths 14 to 52 mm. All but three collected by Carl Spitzer family from same locality on the following dates: (12) March 27, 1965; (13) July 17, 1965; (16) February 22, 1966; (1) July 3, 1966; (2) November 2, 1967. One was collected by W. von Hagen on March 12, 1933 at Patagonia, Arizona; one on September 21, 1963 by Gregory Noel and another by William Manzavedo on November 26, 1963 about 5 mi. N. of Nogales, Arizona on Grand Avenue.

#### DIAGNOSIS

The only two previously described diplocentrids in the size range are *Diplocentrus keyserlingi* Karsch, 1880 and *D. whitei* Gervais, 1844. According to the original description and the examination of the types the following comparative data have been obtained:

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	<i>D. keyserlingi</i>	<i>D. whitei</i>	<i>D. spitzeri</i>
1. General coloration	Blackish brown	Dark brown	Light to medium brown
2. Adult length	40 mm	63 mm	50 mm
3. Tarsomere II spine formula	♂ $\frac{44}{55} : \frac{55}{55} : \frac{66}{66} : \frac{66}{66}$	♀ $\frac{55}{66} : \frac{66}{77} : \frac{77}{88} : \frac{88}{88}$	♂, ♀ $\frac{66}{77} : \frac{66}{77} : \frac{77}{77} : \frac{77}{77}$
4. Digital keel	Very strongly dev.; absent on finger	♀ well dev. & extends along finger	♀ weakly represented ♂ well dev. but absent on finger
5. Pectinal teeth	♂ 9, 9	♀ 16, 15	♂ 15, 15; ♀ 12, 12
6. Ratios: <sup>3</sup>			
a. $\frac{6.4}{6.3}$	♂ 0.89	♀ 1.09	0.77 0.66-0.88
b. $\frac{6.7}{6.9}$	♂ 1.26	♀ 1.03	1.07 1.02-1.14
c. $\frac{4.3-4.1}{4.0}$	♂ 0.35	♀ 0.40	0.52 0.46-0.69

<sup>3</sup> See code on last page.

#### DESCRIPTION

*General appearance*.—Both sexes range from a light yellow brown in juveniles to a medium brown in adults. Legs of adults lighter than other structures. Pectines yellow. All ages moderately hirsute, very few punctations and sparsely granular; female less granular than male.

*Prosoma* (Cephalothorax).—*Carapace*. Indefinite fuscous pattern; most noticeable on lighter specimens. Three pair lateral eyes; first pair smaller or about same diameter as second pair; third pair at about 170° angle to other two. Anterior median notch does not extend beyond level of posterior margin of second pair of eyes; somewhat shallower in very young specimens. Ratio of *distance* between anterior margin of carapace and anterior edge of median eyes and *depth* of median notch: 5.56 (4.00-7.90). Male surface covered with very minute granules with small granules scattered along anterior margin. Minute granules absent on female. Moderately hirsute along lateral and anterior margins. Median ocular tubercle dark brown to black and flanked on each side with an elongate, light spot. Furrows: Anterior median broad and shallow; median ocular slight vestige; lateral ocular shallow; central median broad but distinct; vestige of posterior transverse; posterior median deep, narrow, almost slit-like; posterior marginal and posterior lateral well developed but not interconnected.

*Sternum*. Subpentagonal with lateral sides subparallel. Relatively broad, steep sided median furrow extending over approximately one-third

posterior length and abruptly spreading anteriorly into depressed, sub-diamond shaped area.

*Appendages: Chelicera.* Movable finger forked; inferior tine approximately four times length of superior tine; inner superior margin with one large tooth flanked by two considerably smaller subequal teeth; the most distal one on base of superior tine, the base of most proximal one connected to large, median tooth. Fixed finger not forked; bearing two teeth, most proximal one with two subequal cusps, most distal one with apex directed distad. Ventral surface of entire chelicera very densely covered with long whitish bristles.

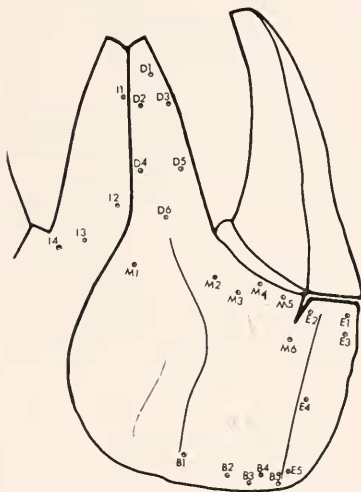


Figure 1

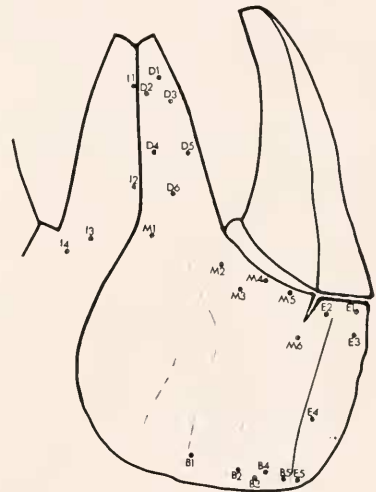


Figure 2

FIGURES 1 and 2. Right pedipalp chela showing trichobothrial patterns of ♂ (1) and ♀ (2). Although the patterns are essentially the same they differ in  $D_{1, 2, 3, 4}$ ,  $M_{1, 2}$  and  $I_{2, 3, 4}$ . The distances vary also between trichobothria in the basal (B) and exterior (E) sets.

*Pedipalps: Chela.* Tarsus (movable finger) slightly reddish on light specimens; moderately to densely hirsute. Basal lobe small—somewhat larger on female—but bearing relatively large tooth; somewhat coarsely punctate.

*Tibia.* Fixed finger like tarsus in general appearance. Four trichobothria (Figs. 1 & 2) inner surface (I); six on exterior surface (D).  $D_1$  slightly distal to  $D_5$ . *Manus* of ♂ adult with well developed costate reticulum on superior surface; moderately so on inferior surfaces; ♀ faintly

costate on both surfaces. Costate reticulum primarily absent on younger instars. Superior surface with scattered coarse punctations. Moderately to densely hirsute on inner and exterior margins and lightly so on superior surface. Fifteen trichobothria (Figs. 1 & 2) arranged in three clusters of 5 each (M, B & E). Keels: Exterior marginal strongly developed and diagonal with distal terminus nearer  $E_2$ ; superior exterior moderately developed on ♂ but only slight vestige on ♀; superior digital very strongly developed on ♂ with only a slight vestige on fixed finger, moderately developed on ♀; superior inner secondary like superior exterior; interior marginal of ♂ well developed and coarsely granular on distal two-thirds, ♀ same but granular on distal one-half. *Patella* (brachium): Dorso-inner keel of ♂ strongly developed and agranular, weaker on ♀, bears three trichobothria; dorso-exterior and exterior median only a slight vestige on distal one-half and agranular on both sexes; ventral inner well developed with widely spaced large, broad granules on both sexes; ventral exterior well developed on ♂, weakly so on ♀, and agranular on both. Dorsal surface agranular and somewhat rugose; distal two-thirds of inner surface densely covered with small granules and one large, cone-shaped granule and one macrochaete on proximal margin; ♂ ventral surface smooth except for a few scattered granules, ♀ agranular and bearing 3 trichobothria along proximal half of exterior margin; exterior surface agranular and bearing 13 trichobothria: 5 proximad, followed by two groups of 2 each plus a widely spaced distal cluster of 4.

*Femur* (humerus). Three trichobothria: One on extreme proximal margin of dorso-inner edge; another on superior surface on exterior margin about 0.2 length from proximal margins; a third, approximately 0.35 of femur length from proximal end just below superior-exterior edge. Keels: Dorso-inner, dorso-exterior, ventral inner well developed and bearing large coarse granules; exterior median lightly vestigial and agranular; ventral exterior absent. Dorsal surface with vaulted area on proximal one-third, bearing a few large granules and a macrochaete; inner surface covered with minute to large granules; one-half of ♂ ventral surface covered with scattered granules. ♀ surface almost entirely agranular; exterior surface almost entirely agranular.

*Walking legs*. Tarsal claws and pedal spurs well developed; median claws moderately developed. Lateral terminal lobes well developed and bearing 3 pair spines. Median lobes extend distally beyond lateral lobes; bear a terminal and one or two superior macrochaetes. Exterior surface of femurs with scattered small granules; inferior edge bearing larger granules with legs I and II bearing the largest. Tarsomere II spine formula

typically  $\begin{matrix} 6 & 6 & 6 & 6 & 7 & 7 & 7 & 7 \\ 6 & 6 & 7 & 7 & 7 & 7 & 7 & 7 \end{matrix}$ ; with slight variations.

*Opisthosoma*.—*Mesosoma* (preabdomen):

*Terga*. Sparsely hirsute: ♂ minutely and densely granular, ♀ agranular, both with some large granules posteriad on VII. Very faint vestiges of median keels and vestiges of two pair of laterals on VII.

*Sternites*. VII with four lateral keels which bifurcate posteriorly and bear confluent granules. Stigma elongate, narrow.

*Genital operculum*. Ovoid (Figs. 3 & 4); width-length ratio: ♂ 2.24 (1.62–3.32), ♀ 2.23 (1.73–3.10); ratio decreases with increase in age. Operculum undivided on ♀; divided on ♂ and bearing genital papillae.

*Pectines*. Lightly hirsute, generally 3 small middle lamellae; angle of basal margin of middle lamellae: ♂ 90°; ♀ 45° (Figs. 3 & 4). Marginal lamella III longer than II. Pectinal teeth typically ♀ 12 (10–13), ♂ 15 (14–16). Sinnesborsten cover about 85% of length of inner ventral surface of ♂ and about 33% of inner edge of ♀ teeth. Basal piece with anterior-posterior margins subparallel; ratio of length to width: ♂ 0.49 (0.32–0.55), ♀ 0.50 (0.38–0.59); ratio of basal piece length to genital operculum length: ♂ 0.89 (0.67–1.40), ♀ 0.96 (0.52–1.31); the ratio decreases with increase in age.

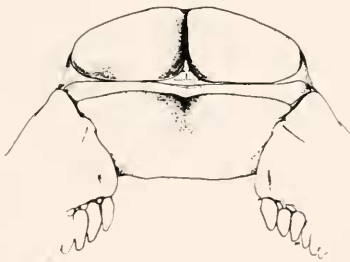


Figure 3A

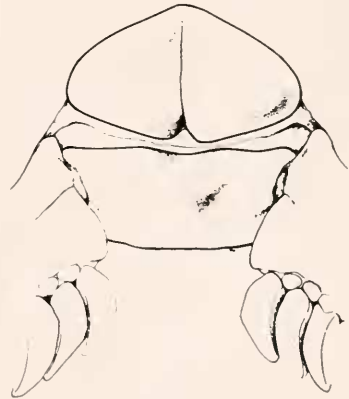
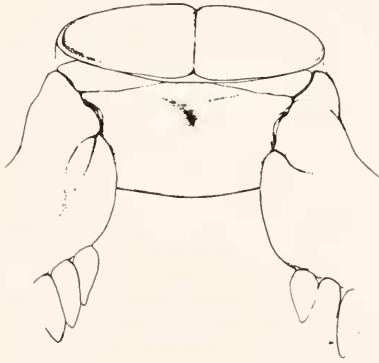


Figure 3B

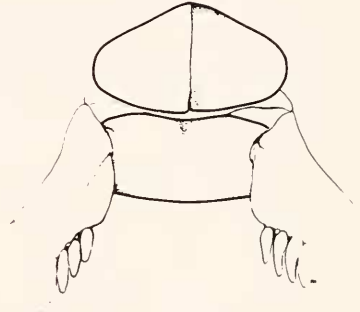
FIGURE 3. Developmental changes in male genital operculum, basal piece and base of pectines. A. 19 mm juvenile; B. 45 mm adult.

*Metasoma* (cauda: postabdomen plus telson). Intercarinal space very minutely and densely granular on ♂; mostly agranular on ♀; lightly hirsute except telson; dorsal furrow moderately developed on segments I–IV; vestigial on V. Keels: Dorsal and superior laterals well developed and bearing confluent granules; median laterals well developed and granular

on segment I, weakly developed and granular on segment II, absent on all other segments; inferior laterals strongly developed, granular and tapering posteriorly on segments I and II; well developed and bearing confluent granules on segment III, vestigial and agranular on segment IV, strongly developed with large granules on segment V; inferior laterals like the preceding except that for the tapering on segments I and II and the absence of the keels on segment IV. Crescentic area strongly developed and outlined by large granules; on ♂ these granules nearly all cone-shaped but on ♀ granules are chisel-shaped. Intercrescentic area bears a cluster of large cone-shaped granules. Anal arch well developed. Anterior crest well developed and bears about 14 large chisel-shaped granules. Posterior crest well developed and densely covered with moderately large granules of various shapes.



**Figure 4A**



**Figure 4B**

FIGURE 4. Developmental changes in female genital operculum, basal piece and base of pectines. A. 17 mm juvenile; B. 45 mm adult.

*Telson.* Moderately to densely hirsute. Agranular except for clusters of 3:2:3 very large granules on ventro-proximal margin. Aculeus short, sharply curved with large, blunt subaculear tubercle. Ampulla about same width as caudal segment V.

#### DISCUSSION

The ratios on Table I indicate little sexual dimorphism. Only ratios 14, 15 and 16 are indications and these deal exclusively with the pectines, basal piece and genital operculum. Subjectively sexual dimorphism is indicated by the well developed digital keel and costate reticulum of the

TABLE 1. Ratios<sup>1</sup>

	Type		Means and Ranges	
	Holotype	Allotype <sup>a</sup>	♂	♀
1. $\frac{4.0}{4.3}$	0.95	0.96	0.94 (0.80-1.00)	0.94 (0.87-1.03)
2. $\frac{4.0}{6.51}$	1.27	1.36	1.37 (1.23-1.58)	1.42 (1.32-1.50)
3. $\frac{4.0}{6.7}$	1.14	1.28	1.25 (1.10-1.41)	1.32 (1.24-1.40)
4. $\frac{4.0}{6.9}$	1.21	1.36	1.35 (1.17-1.53)	1.41 (1.33-1.50)
5. $\frac{4.5}{4.11}$	0.54	0.62	0.55 (0.46-0.60)	0.56 (0.46-0.63)
6. $\frac{4.2}{4.9}$	6.67	7.12	6.28 (5.05-7.50)	6.44 (5.22-7.67)
7. $\frac{4.3-4.1}{4.0}$	0.51	0.52	0.52 (0.46-0.69)	0.52 (0.45-0.62)
8. $\frac{6.2}{6.4}$	2.13	2.08	2.12 (1.89-2.43)	2.08 (1.86-2.38)
9. $\frac{6.2}{6.6}$	1.59	1.69	1.68 (1.59-1.78)	1.68 (1.60-1.76)
10. $\frac{6.4}{6.5}$	1.62	1.70	1.56 (1.35-1.68)	1.55 (1.35-1.70)
11. $\frac{6.51}{6.6}$	0.71	0.72	0.78 (0.67-0.82)	0.75 (0.68-0.81)
12. $\frac{6.7}{6.9}$	1.06	1.06	1.08 (1.04-1.27)	1.07 (1.02-1.14)
13. $\frac{6.9}{6.10}$	2.35	2.27	2.20 (2.00-2.44)	2.17 (2.00-2.39)
14. $\frac{6.12}{7.21}$	0.93	1.36	1.14 (0.93-1.55)	1.42 (1.31-1.60)
15. $\frac{7.21}{7.22}$	1.00	1.29	1.02 (0.98-1.09)	1.25 (1.20-1.85)
16. $\frac{7.6}{7.8}$	0.69	0.67	0.89 (0.67-1.40)	0.96 (0.52-1.31)
17. $\frac{3.00}{4.00}$	4.39	3.66		
18. $\frac{4.00}{8.13}$	1.05	1.21		
19. $\frac{6.1}{6.11}$	0.97	0.97		
20. $\frac{8.13}{8.1}$	1.80	1.87		

<sup>1</sup> See code on last page.

male in contrast to a much weaker development of these structures on the female. The male genital operculum is divided and genital papillae are present. These conditions do not exist on the female. In the adult the male pectinal teeth are both longer and wider. The basal margin of the middle lamellae at all ages above first instar forms nearly a 90° angle with the dentate margin on ♂s and about a 45° angle on ♀s. Caudal segment V which is very frequently much longer on the ♂ shows some sex dimorphism in ratio with the carapace length (ratio #18).

#### ACKNOWLEDGMENTS

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#### NUMERICAL CODE

3.0	Metasoma (caudal) length	6.5	Thickness of manus
4.0	Carapace length	6.51	Length of exterior margin of manus (underhand)
4.1	Anterior width of carapace	6.6	Pedipalp tarsus length
4.2	Carapace width at level of median eyes	6.7	Pedipalp patella length
4.3	Posterior width of carapace	6.9	Pedipalp femur length
4.9 <sup>5</sup>	Width of median ocular tubercle	6.10	Pedipalp femur width
4.11	Distance between posterior margin of median eyes and posterior margin of carapace	6.11	Leg IV length
		6.12	Leg IV coxa length
6.1	Pedipalp length less coxa	7.21	Length of pecten
6.2	Length of pedipalp tibia	7.22	Length of dentate area of pecten
6.3	Length of pedipalp manus	7.6	Length of pecten basal piece
6.4	Width of manus	7.8	Width of pecten basal piece

<sup>5</sup>This is not the width of ocular diad which technically would be the sum of the diameters of the two median eyes. The width of the median ocular tubercle is the distance between the lateral margins of the median eyes.

#### LITERATURE CITED

STAHNKE, H. L. 1967. *Diplocentrus bigbendensis*, a New Species of Scorpion. Ent. News 78(7): 173-179.

#### 2.0003 *Diplocentrus spitzeri*, a new Arizona species of scorpion.

ABSTRACT.—A medium sized species, light yellow brown to medium brown; pectines yellow; moderately hirsute, very few punctations and sparsely granular; type locality: 8.8 mi. e. Nogales; collected: July 17, 1965.—R. H. ARNETT, JR.

*Descriptors:* scorpion; Diplocentridae; *Diplocentrus spitzeri*, nsp.; Arizona.

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